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Clinical Evaluation of Plasma Cholinesterase with Clinical Symptomatology in Organophosphorus Poisoning

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Abstract

Objective: Level of plasma cholinesterase and its association with clinical manifestations.

Methods: This is a prospective study and observation study of 50 cases of organo phosphorus poisoning compound admitted in casualty and intensive care department. In present study we were evaluated plasma cholinesterase levels and correlate with clinical symptomatology in organo phosphorus poisoning, also included patient requiring ventilator support in respiratory failure patients. Prior approval for the study and the protocol was obtained from the institution ethical committee. In present study, serum cholinesterase estimation was repeated on after 6 hours, 12 hours, 24 hours, 48 hours, 96 hours and 7th day of stay in intensive care unit. The serum cholinesterase activity was measured by Genx cholinesterase butyryl thiocholine method (quantitative determination of cholinesterase in human serum).

Conclusion: In present study 50 cases of organophosphorus compound poisoning admitted to our tertiary care centre. Commonest age group 21 to 30 years and 31 to 40 years. Serum cholinesterase is a useful marker for predicting clinical outcome in op poisoning as marked reductions are associated with increased need for ventilator support, atropine requirement, duration of hospital stay and outcome. Serum cholinesterase levels correlated well with clinical manifestation, severity of poisoning, ventilator support required or not and outcome.

Keywords: Serum Cholinesterase; Organophosphorus Compound; Cholinesterase Butyryl Thiocholine.

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INTRODUCTION

Now a days, role of anesthesiologist varies apart from traditional indoor patient management for various operative procedures under various surgical fraternities to intensive and critical care management, pain relief, disaster management, etc. Anesthesiologists are mainly concerned with many medical emergencies, resuscitation in casualty, to support physician in intensive care unit, intensive

cardiac care unit, intensive respiratory care unit, intensive pediatrician care unit, etc. They are supposed to be master in this area. Among medical emergencies, organophosphorus compound poisoning is coming with increasing number of casualties in many developing counties.

More than 100 organophosphorus compounds are currently available for use as an insecticide. Organophosphorus compounds continue to be frequent reason for admission in hospital and ICU. World Health Organization has estimated that around 3 million people die every year due to various poisonings. It is estimated to be around 2.5 to 3.5 lakh deaths globally. Pesticide poisoning has become major health problem in developing country as millions of people are exposed to hazardous pesticides. On one side, these pesticides are used to increase yield in farming whereas on the other hand poverty (in developing countries like India) has led to face the dangerous side effects by self poisoning i.e. suicidal attempts leading to increase in casualties and mortality and thereby increasing strain on hospital services. The exact prevalence of organophosphorus compound poisoning in India is uncertain due to lack of data and proper reporting. In many reports in India, rate of suicidal poisoning ranges from 10.3 to 43.8%.[1]

Amongst these hospital mortality rate is as high as 20% to 70%.[2] Organophosphorus compounds causes accumulation of acetylcholine in synaptic gap via inhibition of acetyl cholinesterase enzyme and thereby decreasing degradation of acetylcholine. This leads to increase in cholinesterase activity and appearance of cholinergic symptoms, which mainly affects respiratory and other neuromuscular junctions. There is sustained depolarization, resulting in respiratory insufficiency due to paralysis of muscles of respiration.[3,4]

Pralidoxime is the main antidote of organophosphorus poisoning; dose needs to be adjusted as per time of consumption and severity of poisoning.[1] Main role of anesthesiologist in these circumstances is to start regular respiratory assistance either by assisted or mechanical ventilation. It is of prime importance to reduce the mortality and morbidity related to organophosphorus compounds.

This study was done to evaluate correlation of acetyl cholinesterase enzyme levels with type of poisoning, quantity of poisoning, duration of symptoms, duration of treatment and necessity of mechanical ventilation. All these factors were correlated with clinical profile, acetyl cholinesterase level, duration of mechanical ventilation, final outcome as mortality and morbidity in patient of organo phosphorus poisoning.

MATERIAL AND METHODS

This is a prospective study and observation study of 50 cases of organo phosphorus poisoning compound admitted in casualty and intensive care department. In present study we were evaluated plasma cholinesterase levels and correlate with clinical symptomatology in organo phosphorus poisoning, also included patient requiring ventilator support in respiratory failure patients. Prior approval for the study and the protocol was obtained from the institution ethical committee.

After explaining the possible prognosis in the course of organo phosphorus poisoning, consent from a responsible attendant, information of patient obtained before the actual study was initiated. In present study, we were taken inclusion criteria as history of exposure to organo phosphorus compound as indicated by patient or relative or referring doctor with characteristic sign and symptom of op compound. In present study we were taken exclusion criteria as food poisoning, sedative poisoning and chronic liver disease or pancreatic disease.

Provisional diagnosis of op compound poisoning was made on basis of definite history of poisoning given either by the patient or the patients attendant which was substantiated by examination of container or smell of clothes or typical clinical features such as excessive secretion, miosis, fasciculation, convulsion, or flaccid paralysis, or characteristic odour of stomach wash or vomitus.

Each patient enrolled in the study underwent a detailed examination with particular reference to vital sign, assessment of central nervous system, respiratory system and cardiovascular system. This examination was carried out at initial presentation in the emergency room and the cases were followed up during their ward and intensive care unit department. Collect 5ml serum sample using standard sampling tube on admission and serial interval in mentioned in our study, for estimation of plasma cholinesterase levels.

In present study, serum cholinesterase estimation was repeated on after 6 hours, 12 hours, 24 hours, 48 hours, 96 hours and 7th day of stay in intensive care unit. The serum cholinesterase activity was measured by Genx cholinesterase butyryl thiocholine method (quantitative determination of cholinesterase in human serum) proton best in class company kit. Reference range for serum cholinesterase in the lab was 4500 - 11500 U/L. Gene Cholinesterase Butyryl Thiocholine Method, Principle behind is cholinesterase catalyses the hydrolysis butyrylcholine, forming butyrate and thiocholine, thiocholine reduces yellow potassium hexacyanofer rate to colourless potassium hexacyanofer rate. The decrease of absorbance at 405 nm is proportional to the activity of CHE in sample.

Butyrylthiocholine + H_2O <cholinesterase> thiocholine + butyrate

2Thiocholine+2[Fe(CN)^6]3+2OH→Choline +H_2O+2 [Fe(CN)^6]4

Reference Value

Children: 4500—11500U/L

Males upto and Above 40 Years: 4000—11500U/L

Females upto and Above 40 Years: 3830—10800 U/L

During their follow up in ward and intensive care unit, each patient was closely monitored and ventilator support was considered in patient with respiratory failure. Biochemical value Inassessing the severity of op compound predicted in terms of need mechanical ventilation therapy.

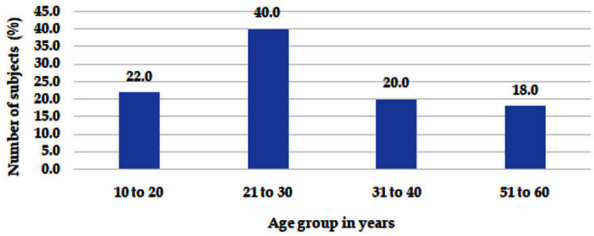
RESULTS

In present study 50 patients coming with consumption of OP poisoning in the casualty of tertiary care centre where assess and treated according this patients where in the various age group as shown in Table.

Table 1: Age wise distribution of patient

-		Frequency	Percent
Age group in years	10 to 20	11	22.0
	21 to 30	20	40.0
	31 to 40	10	20.0
	51 to 60	9	18.0
	Total	50	100.0

Graph 1: Age wise distribution of patient



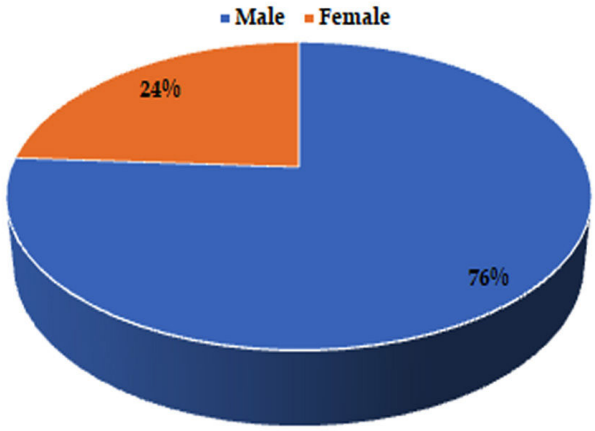
There were 11 patients in age group 10 to 20 years, 20 patients group in 21 to 30 age group, 10 patients in 31 to 40 age group and 9 patients in age group 50 to 60 and above were noted.

There were maximum number of patients 60% age group range 21 to 30 and 31 to 40 years age.

Table 2: Sex wise distribution of patients

-		Frequency	Percent
Sex	Male	38	76.0
	Female	12	24.0
	Total	50	100.0

Graph 2: Sex wise distribution of patients



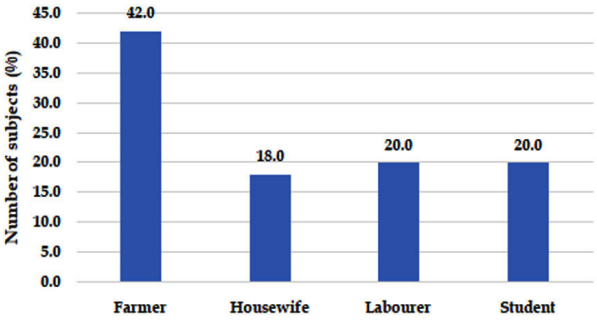
From above table, it was noted that there were 38 (76%) male patients and 12 (24%) female patients, these, there was male preponderance noted as far as consumption of OP compound is consider.

These 50 patients were further evaluated for occupation and it was noted as shown in Table.

Table 3: Occupation wise distribution of patients

-		Frequency	Percent
Occupation	Farmer	21	42.0
	Housewife	9	18.0
	Labourer	10	20.0
	Student	10	20.0
	Total	50	100.0

Graph 3: Occupation wise distribution of patients



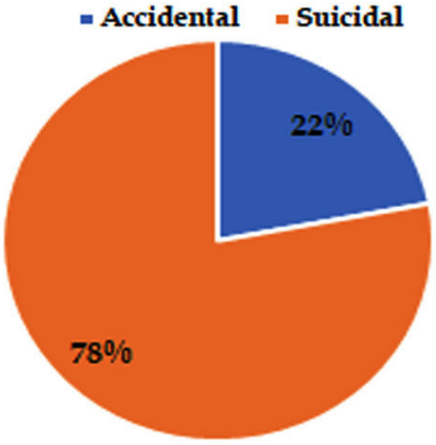
There were 21 (42%) patients were farmer by occupation, Female patients 9 (18%) were housewife, 10 (20%) patients were labourer and 10 (20%) patients were students. Consumption of OP compound noted, maximum patients occupation was Farmer.

These patients evaluated for the accepted cause of consumption as shown in table.

Table 4: Distribution of patients according to mode of consumption

-		Frequency	Percent
Suicidal/	Accidental	11	22.0
Accidental/	Suicidal	39	78.0
Homicidal	Total	50	100.0

Graph 4: Distribution of patients according to mode of consumption.



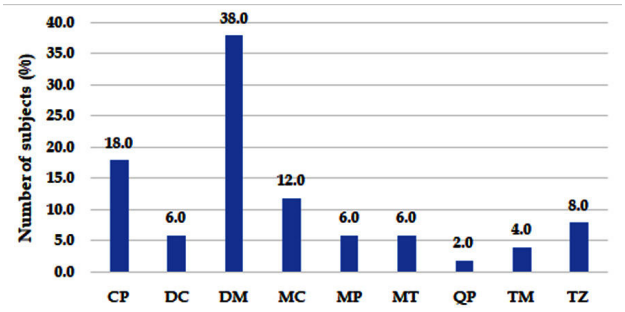
It was noted that maximum numbers of patients consumed OP compounds for suicidal purpose 39 (78%) and accidental consumption in 11 (22%) patients.

Distribution of OP compound consumed by these patients was shown in table.

Table 5: Distribution of OP compound consumed

	-	Frequency	Percent
Compound	CP (Chlorpyrifos)	9	18.0
	DC (Dichlorofos)	3	6.0
	DM (Dimethoate)	19	38.0
	MC (Monochrotophos)	6	12.0
	MP (Methyl parathione)	3	6.0
	MT (Malathion)	3	6.0
	QP (Quinolphos)	1	2.0
	TM (Thiamate)	2	4.0
	TZ (Trizofos)	4	8.0
	Total	50	100.0

Graph 5: Distribution of OP compound consumed



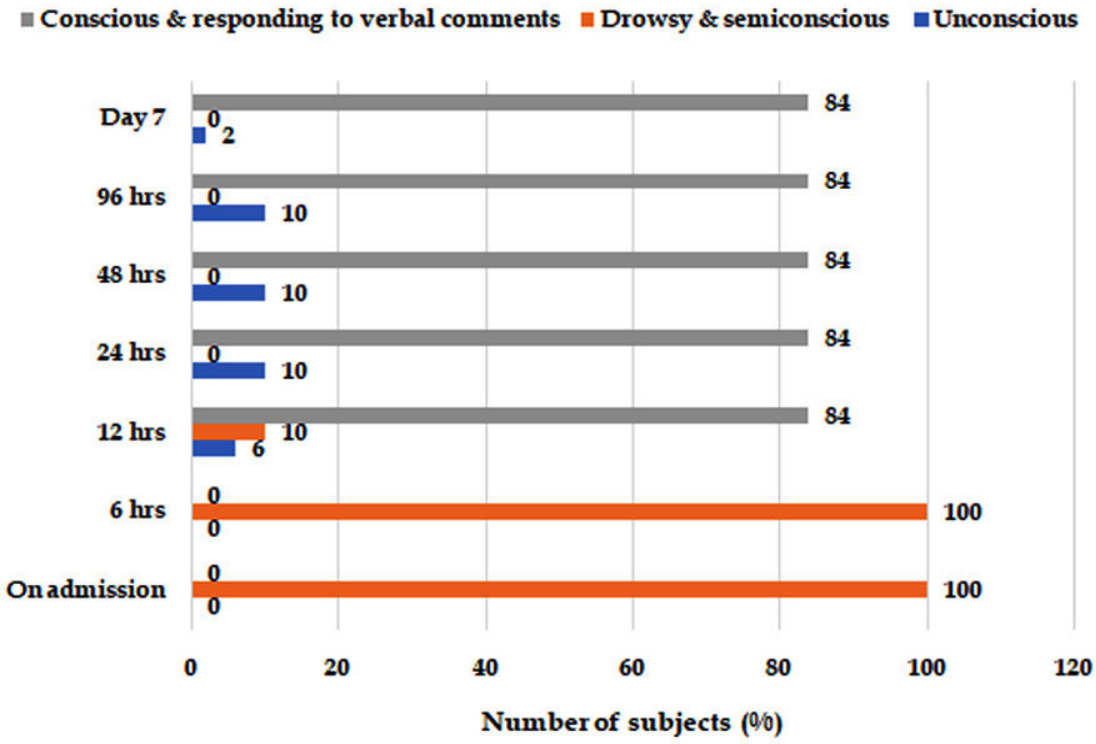
It was noted that maximum number of patients that is 19 (38%) consumed DM (Dimethoate) followed by CP (Chlorpyrifos) 9 (18%) Patients.

In the casualty these patients were examined for status of consciousness, It was noted as unconscious, semiconscious, drowsy, conscious and responding to verbal commands. The condition of patients were shown in table.

Table 6: Distribution of status of patient

	-	Unconscious		Drowsy & semiconscious		Conscious & Responding to verbal comments	
Status	On admission	–	–	50	100	–	–
	6 hrs	–	–	50	100	–	–
	12 hrs	3	6	5	10	42	84
	24 hrs	5	10	–	–	42	84
	48 hrs	5	10	–	–	42	84
	96 hrs	5	10	–	–	42	84
	Day 7	1	2	–	–	42	84

Graph 6: Distribution of status of patient



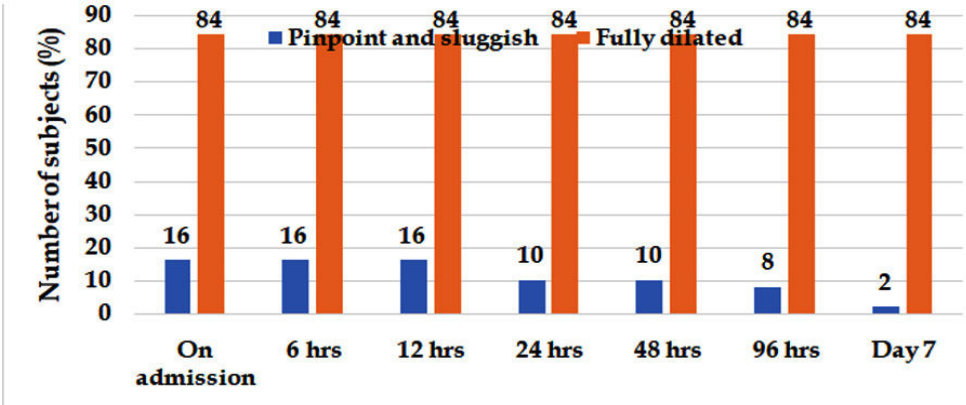
Graph 6: The status was evaluated immediately on admission then after 6 hours, 12 hours, 24 hours, 48 hours, 96 hours and 7 day. Status at various interval shown in table no. 5. It was noted that most of patients were semi-conscious and drowsy. It was also noted that up to 6 hour these patients semi-conscious, at 12 hour 3 patient (6%) were unconscious, 5 patients (10%) semi-conscious and 42 patients (80%) conscious and responding to verbal commands. 24 to 96 hours out-off these patients, 5 patients (10%) develop unconscious. Rest of the patients were conscious and responding to verbal commands at 24 hour and further time interval.

Organophosphorus compound has it direct effect on the size of pupil stating gravity and outcome of these patients, size of pupil evaluated as pin-point, sluggishly reacting to light or fully dilated, reacting to light. The pupil response of the patient for the treatment as either atropinisation or PAM was corresponding to the size of pupil and reacting to light. Size of pupil on admission and at various time interval as 6 hour, 24 hour, 48 hour, 96 hour, 7 days was noted as shown in the table.

Table 7: Distrubution of pupil status at various time interval

-		Pinpoint and sluggish		Fully dilated	
Pupils status	On admission	8	16.0	42	84.0
	6 hrs	8	16.0	42	84.0
	12 hrs	8	16.0	42	84.0
	24 hrs	5	10.0	42	84.0
	48 hrs	5	10.0	42	84.0
	96 hrs	4	8.0	42	84.0
	Day 7	1	2.0	42	84.0

Graph 7: Distrubution of pupil status at various time interval



It was noted that on admission and various time interval 42 (84%) patients pupil were semi-dilated, dilated reacting to light indicating severity of consumption of op compound in a patient were pupil pin-point and sluggishly reacting to light up to 12 hours, in 5 patients 24 hour, 48 hour, 4 patients in 96 hours, the pupil pin-point sluggishly reacting to light indicating severity and effects of op compound on various system.

Table 8: Distribution of patients according to convulsion at various time interval.

	-	Absent		Present	
	On admission	42	84.0	8	16.0
	6 hrs	–	–	50	100.0
	12 hrs	–	–	50	100.0
Convulsions	24 hrs	–	–	50	100.0
	48 hrs	–	–	50	100.0
	96 hrs	–	–	50	100.0
	Day 7	–	–	50	100.0

In OP compound poisoning many times patient come with convulsion as symptoms, presence of convulsion on admission as well as at various time interval as shown in above table.

In 42 patients (84%) there were no convulsion as first presenting complaint on admission. On 8 patient (16%) had convulsion indicating severity of OP compound consumption as well as quantity of drug and delay in the time to attend medical treatment at 6 hour then after these convulsion subside in most of patients.

Graph 8: Distribution of patients according to convulsion at various time interval.

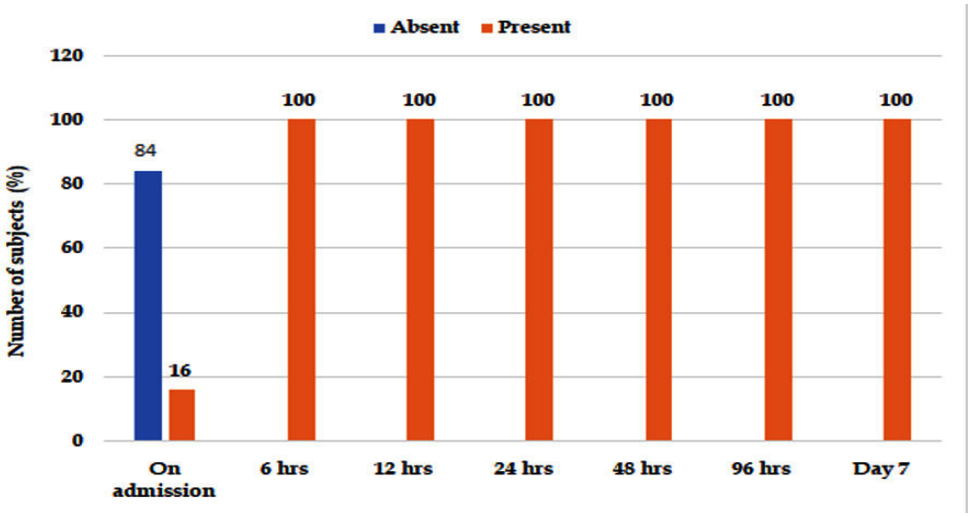
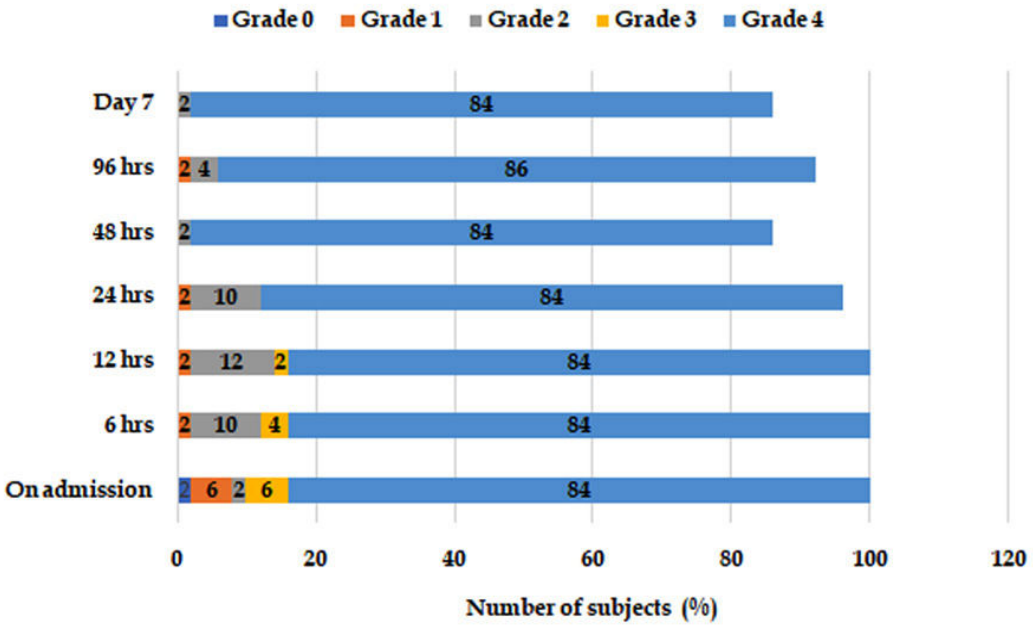


Table 9: Distribution of patients according to motor power at various time interval.

Motor power	On admission		6 hrs		12 hrs		24 hrs		48 hrs		96 hrs		Day 7	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
–	1	2.0	–	–	–	–	–	–	–	–	–	–	–	–
1	3	6.0	1	2.0	1	2.0	1	2.0	–	–	1	2.0	–	0
2	1	2.0	5	10.0	6	12.0	5	10.0	1	2.0	2	4.0	1	2.0
3	3	6.0	2	4.0	1	2.0	–	–	–	–	–	–	–	–
4	42	84.0	42	84.0	42	84.0	42	84.0	42	84.0	43	86.0	42	84.0

Graph 9: Distribution of patients according to motor power at various time interval



OP compound directly affects motor system, acting at neuro-muscular junction, these direct effects on motor power, according to Bromage scale motor power asses as grade 0-complete paralysis, 1-as flicker movement, 2-active movement with eliminating gravity, 3-active movement against gravity, 4-active movement against resistance, 5-normal muscle power. These 50 patients were assessed for motor power on admission as well as 6 hours, 12 hours, 24 hours, 48 hours, 96 hours, day 7. On admission only one patient (2%) had complete paralysis with power 0, grade 1 power was noted 3(6%) patients on admission and 1 patient (2%) on admission, 5 patients (10%) at 6 hours, 6 patients (12%) at 12 hours, 5 patients (10%) at 24 hours, 1 patient (2%) at 48 hours, 96 hours, day 7.

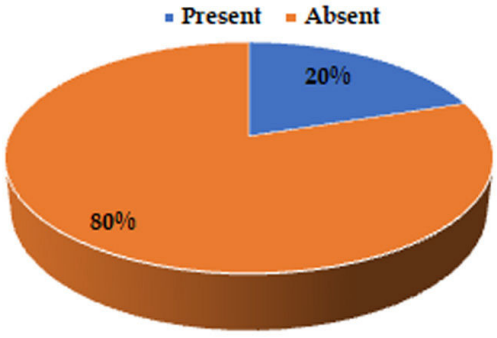
Grade 3 power noted in 3 patients (6%) on admission, 2(4%) patients at 6 hours and 1(2%) patient at 12 hours. Grade 4 motor power that is no effect on motor system was noted 42(84%) patient on admission as well as subsequent time interval.

Again all these patient were assed for presence of respiratory inadequecy requiring respiratory assistance for ventilator support it was shown in table no. 10.

Table 10: Distribution of patients according to Respiratory failure

-		Frequency	Percent
Respiratory Failure	Present	10	20.0
	Absent	40	80.0
	Total	50	100.0

Graph 10: Distribution of patients according to Respiratory failure



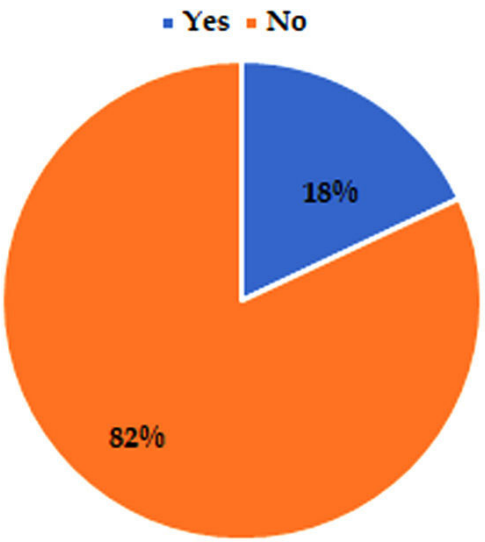
In 40 (80%) patients, respiration of patient adequate or not required respiratory support. In 10 (20%) patient due to gravity of OP compound poisoning there was, respiratory inadequacy and these patients required, respiratory assistance in term of either oxygen supplementation, end tracheal intubation, mechanical ventilation.

Ventilatory support, mechanical ventilation was required 9 (18%) patients, the net result as survival or mortality was noted as shown in table.

Table 11: Distribution of patients according to Ventilatory support.

-		Frequency	Percent
Ventilatory support	Yes	9	18.0
	No	41	82.0
	Total	50	100.0

Graph 11: Distribution of patients according to Ventilatory support



Out of these 50 patients 41(82%) not required ventilatory support and 9(18%) patients required ventilatory support.

Table 12: Distribution of patients according to outcome

-		Frequency	Percent
Outcome	Survived	42	84.0
	Death	8	16.0
	Total	50	100.0

Above table shows that out of 50 patients, 42(84%) of patients responding well to treatment and discharged from hospital. 8(16%) patients succumb to death in spite of intensive care management.

Graph 12: Distribution of patients according to outcome

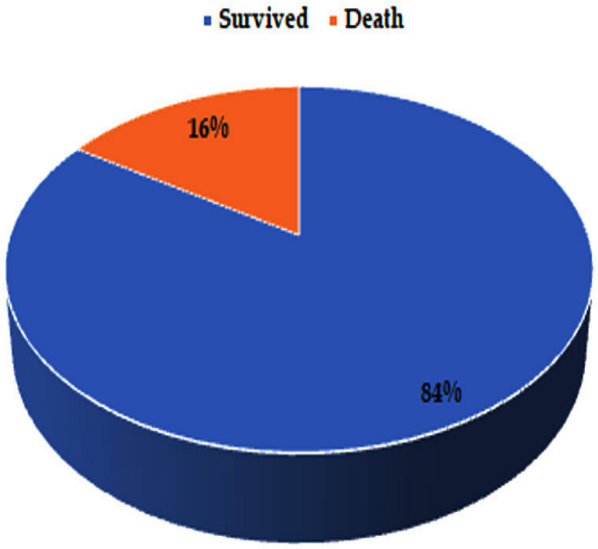


Table 13: Association between mean Serum Cholinesterase and outcome at various time intervals

Outcome		N	Mean	Std. Deviation	t	p	Inference
SC On Admission	Survived	42	2805.57	1331.14	4.712	0.00001	Highly significant
	Death	8	565.00	198.94		(<0.001)	
SC 6 hrs	Survived	42	2647.33	755.01	4.720	0.00001	Highly significant
	Death	8	1331.88	489.62		(<0.001)	
SC 12 hrs	Survived	42	3099.00	881.19	3.575	0.0001	Highly significant
	Death	8	1956.88	395.27		(<0.001)	
SC 24 hrs	Survived	42	3938.19	734.06	4.037	0.00001	Highly significant
	Death	5	2570.40	497.13		(<0.001)	
SC 48 hrs	Survived	42	4503.60	859.03	4.564	0.00001	Highly significant
	Death	5	2658.80	806.23		(<0.001)	
SC 96 hrs	Survived	42	4950.12	969.31	6.003	0.00001	Highly significant
	Death	4	2001.75	283.76		(<0.001)	
SC 7 days	Survived	42	5780.29	1436.77	2.738	0.00900	Highly significant
	Death	1	1800.00	–		(<0.001)	

These entire patient's serum cholinesterase enzyme was estimated on admission and 6 hours, hours, 24 hours, 48 hours, 96 hours and day 7. In 42(84%) patient mean SC value was 2805.57 ± 1331.14 significantly higher as compare to SC level in patient mortality, 8(16%) patients (mean-565.0±198.94) at 6 hour the patient survived the mean SC level was 2647.33±755.01, 12 hour it was 3099.0±881.19, at 24 hour it was 3938.19±734.06, at 48 hour it was 4503.60±859.03, at 96 hours it was 4950.12±969.31, at day 7 it was survived patient was 5780.29±1436.77.

These value were significantly higher at all time intervals when SC level were compare to value in patient who succumb to death. Again it was noted that SC value go on increasing as Various time interval as compare to value as admission.

Graph 13: Association between mean Serum Cholinesterase and outcome at various time interval

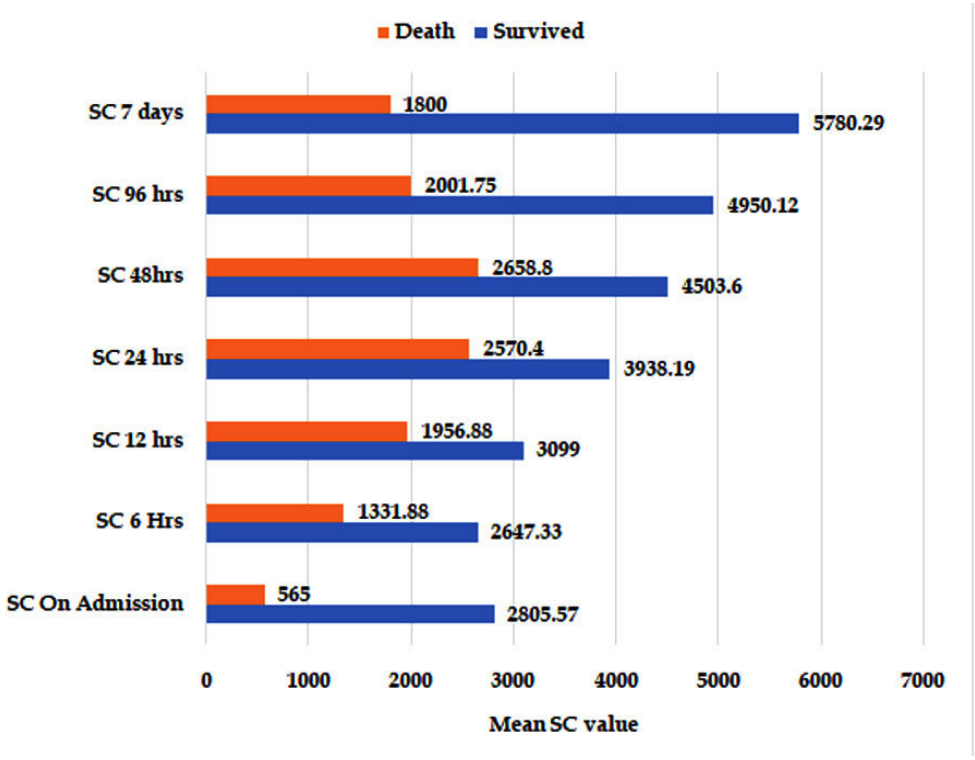


Table 14: Association between mean SC and ventilatory support at various time interval

Ventilatory support		N	Mean	Std. Deviation	t	p	Inference
SC On Admission	Yes	9	1041.67	1056.50	-3.499	0.001	Highly significant
	No	41	2755.59	1378.89		(<0.01)	
SC 6 Hrs	Yes	9	1693.44	915.57	-3.084	0.003	Highly significant
	No	41	2600.05	773.08		(<0.01)	
SC 12 hrs	Yes	9	2288.67	791.55	-2.356	0.023	Significant
	No	41	3054.02	899.45		(<0.05)	
SC 24 hrs	Yes	7	2932.86	756.82	-3.285	0.002	Highly significant
	No	40	3943.15	749.75		(<0.01)	
SC 48hrs	Yes	7	3296.71	1279.88	-3.087	0.003	Highly significant
	No	40	4484.20	874.60		(<0.01)	
SC 96 hrs	Yes	6	3197.50	1869.27	-3.513	0.001	Highly significant
	No	40	4918.18	981.80		(<0.01)	
SC 7 days	Yes	3	4848.33	2684.57	-0.976	0.335	Highly significant
	No	40	5750.68	1462.56		(>0.05)	

Ventilator support in term of mechanical assisted ventilation was co related with SC levels at various time intervals, it was noted ventilator support was required mostly in patient with low level of SC. Ventilator support was not necessary with in patient of normal or higher SC value.

Graph 14: Association between mean SC and ventilatory support at various time interval.

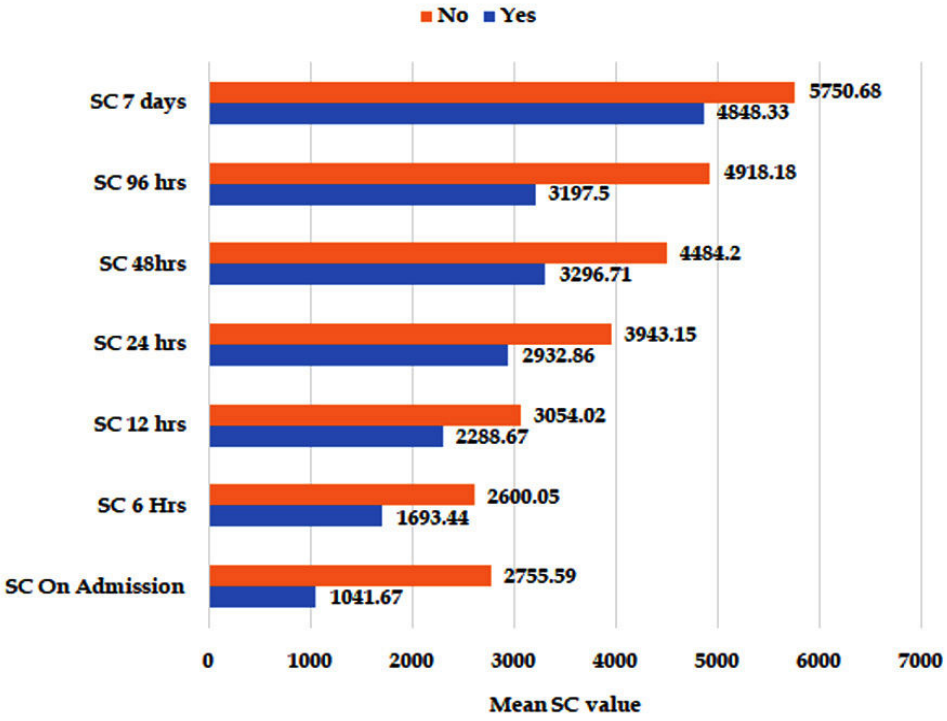


Table 15: Association between Age and outcome

Age group in years	Survived		Death		Total
	Frequency	Percent	Frequency	Percent	
10 to 20	10	23.8	1	12.5	11
21 to 30	17	40.5	3	37.5	20
31 to 40	7	16.7	3	37.5	10
51 to 60	8	19.0	1	12.5	9
Total	42	100.0	8	100.0	50

Chi square test-2.02, p-0.56 (>0.05), Not significant

Graph 15: Association between Age and outcome

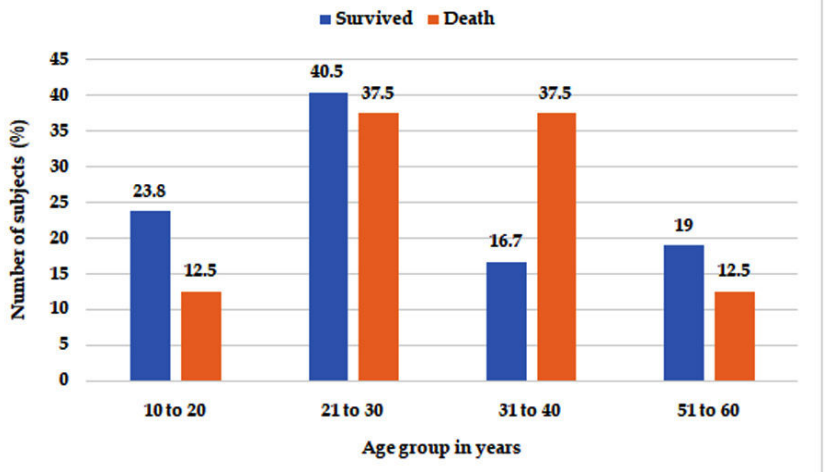
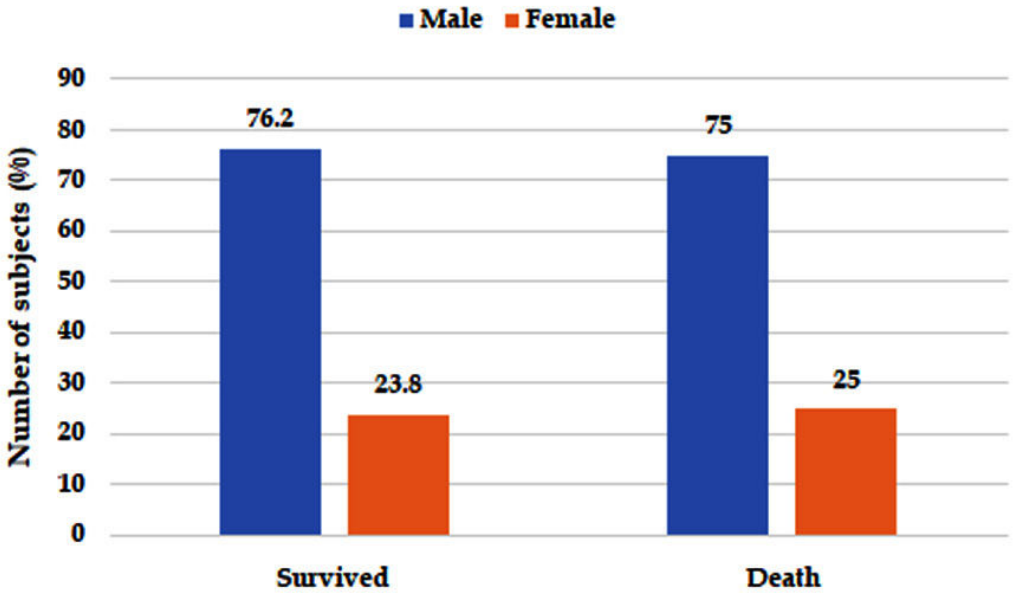


Table 16: Association between Gender and outcome

Gender	Survived		Death		Total
	Frequency	Percent	Frequency	Percent	
Male	32	76.2	6	75.0	38
Female	10	23.8	2	25.0	12
Total	42	100.0	8	100.0	50

Chi square test-0.005, p-0.94 (>0.05), Not significant

Graph 16: Association between Gender and outcome



Descriptive statistics of the variables

Table 17: Discriptive statistics of the variables

-	N	Mean	Std. Deviation	Std. Error	Range	Minimum	Maximum
Age	50	31.04	13.26	1.88	46	14	60
Approximate Quantity in ml	50	27.30	11.88	1.68	50	10	60
SC On Admission	50	2447.08	1475.39	208.65	8735	325	9060
SC 6 Hrs	50	2436.86	865.18	122.36	4088	780	4868
SC 12 hrs	50	2916.26	922.46	130.46	4168	960	5128
SC 24 hrs	47	3792.68	826.73	120.59	3564	1920	5484
SC 48 hrs	47	4307.34	1022.16	149.10	5004	1430	6434
SC 96 hrs	46	4693.74	1251.77	184.56	4675	1775	6450
SC 7 days	43	5687.72	1543.89	235.44	6977	1800	8777
PR On Admission	50	73.44	17.24	2.44	58	50	108
PR 6 hrs	50	110.68	10.26	1.45	50	94	144
PR 12 hrs	50	105.28	16.23	2.30	84	40	124
PR 24 hrs	48	105.83	15.44	2.23	94	50	144
PR 48 hrs	47	103.57	19.30	2.82	88	40	128
PR 96 hrs	45	105.87	18.54	2.76	96	48	144
PR 7 days	43	107.95	12.03	1.83	72	52	124
SBP On Admission	50	110.80	14.21	2.01	70	80	150
SBP 6 Hrs	50	111.88	9.78	1.38	50	100	150

SBP 12 hrs	50	112.08	11.05	1.56	62	88	150
SBP 24 hrs	48	110.02	17.65	2.55	132	18	150
SBP 48 hrs	47	111.36	10.45	1.52	60	90	150
SBP 96 hrs	45	112.49	11.55	1.72	70	80	150
SBP 7 days	43	113.35	10.83	1.65	50	100	150
RR on Admission	50	31.48	4.48	0.63	20	22	42
RR 6 hrs	50	31.48	4.48	0.63	20	22	42
RR 12 hrs	50	31.64	4.49	0.64	20	22	42
RR 24 hrs	48	31.50	4.40	0.63	20	22	42
RR 48 hrs	47	33.28	4.42	0.64	18	24	42
RR 96 hrs	45	31.73	4.82	0.72	18	24	42
RR 7 days	43	31.53	4.47	0.68	18	24	42

Anesthesiology is consider as secondary importance's branch in medical fraternity, while reviewing importance's of anesthesiologist. They came across various medical emergency and that to their role remains vital importance's. In the casualty department of various medical institute. There might be various patient with various medical emergency, tertiary medical institute in their casualty department patient with medical emergency requiring institutional intensive care unit services with availability of various experts. Many times accidental medical emergency commonly come across in the surgical fraternity but medical emergency are also very common.

In medical emergency like acute myocardial infarction, acute respiratory distress, end stage liver disease or many common with some incidence of acute poisoning. In acute poisoning severe gastritis, gastroenteritis, colitis are come across with mass casualty of food poisoning. Organo phosphorous poisoning is one more important medical emergency coming across in country, mainly district level hospital and may be from their referred to medical institute. Organo phosphorous compound are used worldwide in agriculture as well as in household gardens.[2] Their is easy availability of these compound resulting in gradual increasing in accidental, suicidal poisoning, mainly developing country. Organo phosphorus poisoning may result as accidental, suicidal or homicidal.

World health organization had estimated around 3 million people died every year due to various poisoning but actual incidence of organo phosphorous poisoning is difficult to find out. It is estimated to around 2 lakh to 3.5 lakh deaths per year around world.[1]

In India agriculture industry, these compound abundantly used, many times these compound easily available over the country in cheaper prices and indiscriminate used hence handling and storage had increased the number of poisoning cases. The incidence of organo phosphorous poisoning in India is highest among the world. Recent data from national crime bureaus showed that suicide by consumption pesticide is approximate 90% in all cases of poisoning related deaths in India. The rate of suicide poisoning with organo phosphorous compound ranges from 10% to 43% in young adult female farmer and from low socio-economic strata.[1]

Anesthesiologist consider to be leaders in the intensive care management with their expertise in the field of resuscitation, basic life support and managing capability in the field of ventilator therapy, play vital role, hence anesthesiologist are mainly called for management of acute poisoning particularly organo phosphorous poisoning compound, after consumption of organo phosphorous compound act by inhibiting cholinesterase activity, estimation of acetyl cholinesterase level is done to asses severity of organo phosphorous compound poisoning, considering availability limited resources. It is important that treatment priority should be made depending on severity of poisoning as well as availability of intensive care unit beds and manpower, so it pertinent that severity of poisoning needs to certain, base on clinical and laboratory assessment, as coated organo phosphorous compounds act by inhibiting both cholinesterase and pseudo cholinesterase activity irreversibility and fact that these leads to accumulation of acetylcholine at synapse causing over stimulation of acetylcholine receptor with distributions of neurotransmission in the central and peripheral nervous system, so it is range to estimate, acetylcholine level to assess severity of organo phosphorous poisoning.

Syed M. Ahmed 2014 et al.[2], *V Agrawal* 2018 et al.[1], *G.V Rao* 2016 et al.[39], *D.V Murthy* 2013 et al.[35], *Murat Sungur, Muhammed Guven* 2001 et al.[30], *Michael*

Eddleston, Surjith Singh 2006 et al.[33], *John victor peter, Thomas Isaiah sugarcane* 2014 et al.[37], *M. Eddleston, Andrew Dawson* 2004 et al.[32], *Fazle Rabbi chowdhary* 2015 et al.[38], *James O. J. Davis* 2008 et al.[34], *T Yardan* 2016 et al.[41], *V. Honnakatti* 2018 et al.[44], *V. A. Kothiwale* 2020 et al.[45], *Sudisha Mukherjee* 2020 et al.[46] all have work on clinical profile of organo phosphorous poisoning with role of anesthesiologist for ventilator support in correlation with cholinesterase levels.

The Present randomize prospective study was also plan emphasize the role of anesthesiologist in patient requiring ventilator support and its correlation with acetylcholine level at various time interval in the orango phosphorous compound poisoning. In the present study, age wise distribution of patients with organo phosphorous compound poisoning when consider, it was noted that consumption of organo phosphorous compound is most common between Age group 21 to 30 years followed 31 to 40 years. It is less common in below 20 year and geriatric patient, male preponderance was 76% and female 24%, 21 to 40 year age range most commonly are male workers in agriculture industry and in some other places. In India, male workers usually workers in agriculture due to their ability and working fields, that is also age ranges where total responsibility of financial working strategy in India.

The incidance of poisoning is comparatively asses in the geriatric and pediatric age group, as there are not suppose working in agriculture field. There were 42% farmer, 20% labourer, 20% student and 18% housewife for organo phosphorous consumption, again it is well formulated that male gender, mainly workers in the field as farmer and labourer. 18% female patients were housewife and rarely the students come across with organo phosphorous poisoning. 78% of patients were having suicide background and 22% with accidental farmers and labourer concern with financial and household problems may have consumed organo phosphorous compound as suicidal attempt. Accidental consumption may be there in geriatric and pediatric age group, female patient consumption may be correlated to male preponderance and male atrocity in rural India.

Our observation coincides with studies of *V Agarwal* 2018 et al.[1], *G. V Rao* 2016 et al.[39], *Y. Honnakatti* 2018 et al.[44], *V. kothiwale* 2020 et al.[45], *S Mukherjee* 2020 et al.[46]

In agriculture market in various organo phosphorous compound are under selling at the counter, these are easily available throughout year, but peak in sell is usually in months of July to October. Now due to recent advances in agriculture field and to increase the yield many of the organo phosphorous compound spraying under taken for vegetable, food grain, fruits for better growth and to avoid insecticides affection. In India various organo phosphorous compounds are used for agriculture purpose but due to poverty, economic crisis, quarrel these may be badly used for the suicide purposes, due to easy availability of these compounds, with low prices are used these purposes. Among these dimethoate is commonly used followed by chlorpyrifos compounds many of the authors are also came across organo phosphorous poisoning cases with these compounds.

Our study coincides with these authors, as far as organo phosphorous poisoning is conceal on arrival in casualty, the relative or when the patient conscious was asked, approximate quantity of organo phosphorous consumption and it was around mean 27.30 ± 11.88. After receiving call from casualty, the status of the patient was evaluated as whether unconscious, semiconscious or drowsy, responding to verbal command and fully conscious, on admission, many of the patient were brought semiconscious or drowsy, at 6 hour these patient were drowsy or semiconscious, at 12 hour 6% patients developed unconsciousness, 10% semiconscious and 84% were conscious at responding to verbal command, up to 24 to 96 hours condition of patient remain same as far as status of concealed. The condition of patient usually depends upon volume of compound consumed, whether consumed, empty stomach or fully stomach whether patient was accompanied with anybody or alone place of consumption or site of consumption, resources available for transportation, distance from the hospital or medical aid and time required to reached the hospital. All these variable cannot be pinpointed or given importance for the condition of patient hence we have consider these patient and evaluated the status accordingly without going to detail above factor, *G. V. Rao* 2016 et al.[39], *M. Sungur* 2001 et al.[30] and *James O. J. Davis* 2008 et al.[34] have also evaluated their patient when they reached the casualty, they have also not given much importance above variable, hence our study coincides with the studies of above authors. On examination the size of pupil and reaction to light was evaluated in every patient.

Organo phosphorous compound directly affect, the size and reaction of pupil denoting the severity of status of patient after consumption, size of pupil and reaction to light, governs response of patient to the treatment, consider to be important criteria to follow treatment in the patient, to reaction to

light is usually criteria for cerebral circulation stating hypoxia damage secondary to respiratory inadequacy, size of pupil governs the need of atropinization in the patient. In the present study 16% patient pupil were pinpoint and sluggishly reacting to light, 84% patient pupil were semi dilated to dilated and were reacting to light, 8% of patient, at 96 hours also shown pinpoint and sluggish reaction in the followed. *D. R Murthy* 2013 et al.[35], *V. Agrawal* 2018 et al.[1], *J. V. Peter* 2014 et al.[37], *V. Kottiwale* 2020 et al.[45] have used size and reaction to light of pupils for their treatment modality in their patient. In organo phosphorous poisoning there is inhibition of acetyl cholinesterase enzyme leading to accumulation acetylcholine at synaptic cleft causing overstimulation of iris circular muscle causing miosis of pupil (M3 receptor). Some patient of organo phosphorous poisoning were presented with convulsion and 84% patient presented without convulsion, at 6 hours and the patient with responded well with treatment convulsion were under compound. *Syed. M. Ahmed* 2014 et al.[2] have also noted presence of convulsion in their study. According to them many times, convulsions are secondary to hypoxia due to respiratory inadequacy. The convulsions were tonic-clonic as generalized due to Incordinate muscle fasciculation. Organo phosphorus compound directly affect neuromuscular function, giving flaccid paralysis due to abundant of acetylcholine release at synaptic cleft. There by affecting neuromuscular transmission and muscle contraction.

According to Bromage scale muscle power was assed or medical council scale, motor power graded as grade 0 complete paralysis, grade 1 flickering contraction, grade 2 motor power detectable when gravity excluded, grade 3 motor power against gravity, gravity 4 normal power. In present study, on admission motor power was assessed on according to Bromage scale and complete paralysis was noted in 2% patient. Grade 1 power noted 6%, grade 2-2%, grade 3-6% and no paralysis or grade 4 was noted 84% of the patient. At 6 hours 10% of the patient showed improvement at 12 hours to 48 hours when meticulously observed. Organo phosphorous compound responded to the treatment to atropinization and PAM doses, hence the muscle power was regaining to the normal after receiving the treatment in these patient. *G. V. Rao* 2016 et al.[39], *D. Murthy* 2013 et al.[35], *Michael Eddlestone* 2006 et al.[33], *J. V. Peter* 2014 et al.[37] have also correlated motor power with the treatment response of patient after atropinization and PAM therapy. Our observation can be explain on these around as per motor power conceals. Organo phosphorous compound were primary effect of paralysis of muscle power resulting in generalized muscle weakness particularly limb musculature, abdominal and respiratory muscle weakness or paralysis resulting respiratory inadequacy or complete respiratory failure requiring ventilator support.

In present study 20% patients had respiratory inadequacy from admission and in subsequent period 80% patients had normal, adequate respiration out of these 10 (20%) patients, 9 patients required immediate end tracheal intubation and mechanical ventilation. Out of these 10 patients, 8 patients (16%) succumbed to death in spite of artificial ventilation, meticulous observation and necessary treatment. In present study 8 patients succumbed to death on 1 day 3 patients death followed by 2 day 1 patient death followed by 4 day 2 patients death was noticed and up to 7 day 2 patients death occurred. *V. Agrawal* 2018 et al.[1], have described treatment modality in their patient as far as treatment concealed all patient had given through stomach wash, their cloths were removed and body was clean to avoid further absorption of organo phosphorous compound, patient with respiratory failure required endotracheal intubation with ventilator support was given. These patients initially received intravenous atropine 2-3 gm bolus and was repeated 5-15 minutes depending upon severity of poisoning. Drying of secretion was taken as sign of atropinization and pulse rate 120/min was taken as sign of atropinization, then it was followed drip of atropine to maintain circulatory level, PAM was given to patient, who had consumption organo phosphorous compound. Initial dose of atropine 2 gm followed drip of 2.5 to 5 gm in dextrose normal saline was given, intravenous diazepam was given to prevent restlessness and convulsion. Acetyl cholinesterase level were monitored frequently to correlate dose of atropine, PAM and clinical response of patient. The severity of organo phosphorous poisoning is many times certain either on clinical or laboratory assessment.

These organo phosphorous compound act by inhibiting both cholinesterase and pseudo cholinesterase activity, these leads accumulation acetylcholine at synapse causing overstimulation of receptor and disruption of neurotransmission in both central and peripheral nervous system, hence it is necessary to estimate serum acetyl cholinesterase assessed severity of organo phosphorous poisoning. These action of organo phosphorous compound is counter acted by atropinization and PAM therapy. It was further support with ventilator

therapy as and when required. *G. V. RAO* 2016 et al.[39], *D. R. Murthy* 2013 et al.[35], *M. Sungur* 2001 et al.[30], *Michael Eddleston* 2006 et al.[33], *J. V. Peter* 2014 et al.[37], *T. Yardan* 2016 et al.[41], *V. Honnakatti* 2018 et al.[44], *V. Kothiwale* 2020 et al.[45] were of the same opinion, *V. Agarwal* et al.[1], and they have followed same treatment modality in their patient. Our observation can be explain on above ground and our treatment modality coincides with *V. Agarwal* et al.[1] and others. Organo phosphorous compound poisoning is usually confirmed by levels of butyryl cholinesterase or RBCs Cholinesterase level, acetyl cholinesterase level depression less than 20% correlated to significance organo phosphorous poisoning, while 20 to 40% depression signifies moderate poisoning, here one has to differentiate the other causes low level of acetyl cholinesterase. They are several method for enzymatic assess, as calorimetric method, interferometry, surface acoustic waves, enzyme biosensors etc. the biosensor works on principle that organo phosphorus compound act by inhibiting acetyl cholinesterase which can assessed by direct and indirect. In direct method thiocholine produced by hydrolysis of acetylcholine in presence of water and acetyl cholinesterase level measured, organo phosphorus compound causes acetyl cholinesterase inhibition decreasing thiocholine level.[47-50] In present study acetylcholine cholinesterase estimation carried out by Gene Cholinesterase Butyryl Thiocholine Method, principle behind is cholinesterase catalyses the hydrolysis butyrylcholine, forming butyrate and thiocholine. Thiocholine reduces yellow potassium hexacyanoferrate to colourless potassium hexacyanoferrate. The decrease of absorbance at 405 nm is proportional to the activity of CHE in sample.

Butyrylthiocholine + H_2O <cholinesterase> Thiocholine + Butyrate

2 Thiocholine +2 $[Fe(CN)^6]3$+2 OH→Choline +H_2O+2 $[Fe(CN)^6]4$

Reference Value

Children: 4500-11500U/L

Males upto and above 40 Years: 4000-11500U/L

Females upto and above 40 Years: 3830-10800 U/L

At 6 hours and onward as the pseudo cholinesterase levels start to increasing requirement of ventilator support was corresponding to decrease. It was significantly noted in patient succumbed to death when compare to those patient who responded to treatment *V. Ararwal* et al.[1] in their study emphasize clinical correlation of acute organo phosphorous poisoning with serum cholinesterase activity. They have also noted low levels of serum cholinesterase signifies severe poisoning and correlated to response of the patient to the treatment modality *Syed M. Ahmed* 2014 et al.[2], *G. V. Rao* 2016 et al.[39], *D. R. Murthy* 2013 et al.[35], *T. Yardan* 2016 et al.[41], *V. Honnakatti* 2018 et al.[44], *V. Kothiwale* 2020 et al.[45], *S. Mukhaerjee* et al.[46] all have coated correlation of serum cholinesterase levels to the severity of organo phosphorous compound poisoning. They have signifies importance of pseudo cholinesterase as an aid to treatment modalities for better outcome in patient of organo phosphorous poisoning. Our study was also aim to signify importance of estimation of serum cholinesterase in treatment of organo phosphorous poisoning.

CONCLUSION

- In present study 50 cases of organophosphorus compound poisoning admitted to our tertiary care centre.
- Commonest age group 21 to 30 years and 31 to 40 years.
- Males were the most common victims 38 (76%).
- Commonest occupation was farmer 21 (42%).
- Maximum number of the patient consumed organophosphorus compound for suicide purpose 39 (78%).
- Dimethoate and monocrotophos were the most common compound used by the patients for poisoning.
- Status of patient, convulsion, pinpoint pupil, fasciculation, motor power (complete paralysis) were significantly associated with op compound patient.
- Patient who had lower level of serum cholinesterase within 24 hours had increased mortality.
- Serum cholinesterase is a useful marker for predicting clinical outcome in op poisoning as marked reductions are associated with increased need for ventilator support, atropine requirement, duration of hospital stay and outcome.
- Serum cholinesterase levels correlated well with clinical manifestation, severity of poisoning, ventilator support required or not and outcome.

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